different publishers will announce their programme as soon as they can. Sir George Greenhill, as a veteran tractarian, ought to be personally interested in these successors of his tract on the calculus.

The present series, so far, deals mainly with practical affairs—fortunately not without regard to theory; four of the six tracts are said to be "for the mathematical laboratory." It is to be hoped that this term will not be hackneyed: it is not very happy, in any case, for "a mathematical laboratory" ought to include any place where mathematical experiments are carried on, and experiments are more important than methods of computation. "Number-room" would be shorter and more descriptive; but let that pass, and let us go on to summarise the contents of this parcel.

(1) This has the merit of appreciating the work of Monge, in many ways the greatest master of orthogonal descriptive geometry. The introduction is interesting, though rather amorphous; for instance, the article on "laboratory methods" would have found a better place at the beginning of chapter ii. This chapter deals with a good number of the really fundamental problems on lines and planes; chap. iii. on curved surfaces and space-curves is of a more familiar and less valuable type; chap. iv. is on perspective, and, though very brief, gives some useful hints; chapter v. is on photogrammetry, and the most novel of all. The weakest point in the tract is that nothing is said about dealing with lines that do not meet on the paper; theoretically this is unimportant, but in a drawing-office it is another matter, and auxiliary vanishing points have to be used frequently.

(2) So far as we can judge, this seems to be very well done. There is an outline of the theory of finite differences, the classical formulæ of Simpson, Lagrange, Gauss, etc., and a number of worked and unworked examples. In another edition it might be worth while to give the constants required for Gauss's method (p. 88) in the form of decimals as well as in that of surds.

(3) It is difficult to say what will be the ultimate physical way of stating the principle of relativity, but, thanks chiefly to Minkowski, the mathematical theory is assuming a simple invariant form. The four chapters of this tract deal respectively with Einstein's formulæ, transformation of electromagnetic equations, applications to electron theory, and Minkowski's transformation. Criticism of a physical nature must be left to others; the purely mathematical treatment seems to be all that can be desired. Unfortunately there are very few references—not even one to Minkowski's papers. Without references, a tract cannot perform its proper service as an introduction to an important subject.

(4) This is perhaps the most interesting of the "laboratory" tetrad. The subject being limited, the author is able to give a detailed account, with good examples, of the way in which an irregular periodic graph can be reduced to its harmonic constituents. For work on electric oscillations this tract ought to be very useful. There is also a chapter on spherical harmonics.

(5) This will appeal to astronomers and ordnance survey people, and sailors. The main novelty is the last chapter, on graphical methods, which gives an account of the ingenious inventions of D'Ocagne, Chauvenet, and others. There are numerous examples, worked out to seven places; and others unsolved for the practice of the reader.

(6) This is an excellent tract on what is now an extensive subject. The main points are very clearly put; room has even been found for an outline of non-Euclidean geometry, and the expression of co-ordinates of points on an algebraic curve as one-valued functions. There is a bibliography which seems to include most of the books and papers of really first-rate importance; and there is a sufficient number of diagrams. English-speaking students ought now, at any rate, to appreciate Poincaré's wonderful discoveries in this field.

Mathematicians owe a special debt to Prof. Whittaker for the work he is doing in connection with this series; his encouragement and help are acknowledged in handsome terms by several of the authors.

G. B. M.

OUR BOOKSHELF.

Evolution. By J. A. S. Watson. Pp. vii+153. (London: T. C. and E. C. Jack, 1915.) Price 5*s*. net.

THE object of this work is apparently to provide, in small compass and with copious illustrations, an account of evolution from the lowest forms of life to man. "The Evidence for Evolution" forms the subject-matter of the first chapter, in which well-chosen lines of argument are briefly laid down and illustrated. The three succeeding chapters treat respectively of "Unicellular and Multicellular Animals," "The Worms and some of their Posterity," and "The Early Vertebrates and the Fishes." The fifth, "The Conquest of the Land," leads on to the sixth and concluding chapter, "The Mammals and Man." The illustrations, 146 in number, are largely borrowed from German sources, although the author is wrong in attributing the bust of *Homo primigenius* (Fig. 145) to a German sculptor. It was modelled by an American lady, daughter of Alphæus Hyatt, who will be affectionately remembered by many British

©1916 Nature Publishing Group

naturalists. It is unfortunate that the abundant illustration should have been permitted to justify the heavy, thickly loaded paper used throughout the book. Apart from this distressing feature, the printing is good and clear, and there are not many errors, among which, however, "Neandertal," "Axolotyl," and "trachea" for the plural (p. 71) were noticed. The figures are sometimes good and mostly adequate, a small proportion being distinctly bad. In some of them the description fails to account for the whole of the reference letters.

In speaking of the analogical groups of the Australian Marsupials (on p. 130), the wombat as a representative of the Rodents is an obvious omission (probably the author intended wombat when he wrote bandicoot); and in asserting that there are no marsupial bats, the flying phalangers should have been mentioned as analogous to the flying squirrels. The statement that the size of insects is "somewhat strictly limited" (p. 71) might have been modified by a reference to Carboniferous times, when these forms had the air to themselves.

We believe, in spite of the faults to which attention has been directed, that the book will be useful because of the wide ground covered, the good selection of examples, and the brevity and clearness of the text. E. B. P.

The Gases of the Atmosphere: The History of their Discovery. By Sir William Ramsay. Fourth Edition. Pp. xiii + 306. (London: Macmillan and Co., Ltd., 1915.) Price 6*s*. net.

JUST complaint has been made recently in NATURE of the dearth of good modern popular or semi-popular literature calculated to inform the public of the methods and achievements of natural science. Nothing could be better for this purpose than Sir William Ramsay's book on "The Gases of the Atmosphere," for here we have a first-hand account of modern discoveries in a connected and highly interesting narrative, and presented in a sufficiently elementary style to make the subject intelligible to a large reading public.

Since the book appeared in 1896 a second and third edition have been issued, keeping the story abreast of discovery. In this, the fourth, edition there is not much new matter beyond an account of the remarkable work done by the author and Dr. Whytlaw-Gray on *niton*. The passage of the story from a record of the intrepid and masterly discovery and isolation of the companions of argon into the realm of radioactivity and modern alchemy is perhaps natural and excusable to the author; but it has the effect of a change of key, and causes a fine record of fact to conclude on a note of speculation.

It is impossible in reading this history of the gases of the atmosphere, in which very even justice seems to be done to all discoverers, not to be struck by the honourable part which has been borne by British men of science. Boyle, Mayow, Black, Priestley, Cavendish, Ramsay, and Rayleigh; to these add Scheele and Lavoisier, and no name remains to attach to any capital discovery about the chemistry of the atmosphere. Without in the least wishing to fall into the evil habit of belittling German chemistry, one may be excused for remarking upon its inconspicuousness in this particular field of work. A. S.

LETTERS TO THE EDITOR.

[*The Editor does not hold himself responsible for opinions expressed by his correspondents. Neither can he undertake to return, or to correspond with the writers of, rejected manuscripts intended for this or any other part of* NATURE. *No notice is taken of anonymous communications.*]

Colourless Crystals of Hæmoglobin.

MAY I have some of your valuable space in order to put a question to physiologists and physicists whom I could not reach so conveniently in any other way?

For a long time I have been puzzled by the existence of colourless—white—crystals of hæmoglobin. If one carries out the familiar experiment of mixing a drop of rat's blood and water on the microscopic stage, one finds that while the majority of the crystals grow out as reddish needles, a few crystals appear to be without colour from the first. But more striking still: I have in my possession a preparation of guinea-pig's blood in which, amongst the beautifully formed, deep red, regular tetrahedra (in which form that animal's hæmoglobin crystallises), there are a few crystals quite as well formed as the rest which are perfectly white. The preparation is two years old; originally all the crystals were red; only a few have become bleached during the last year or so. It may be suggested that the preparation has been unduly exposed to the light; this is not so; except when occasionally examined it has been in the dark.

But what *is* colourless hæmoglobin? Physiologists do not know it, or at least they have not described it. Colourless hæmoglobin in the above sense is not mentioned in the exhaustive monograph of Reichert and Brown. So far as I can learn, no leuco or colourless state of hæmoglobin is recognised analogous to the leuco state (reduced state) of hæmocyanin, a blue respiratory pigment, or to the leucoplastid condition of chromoplastids in plants.

Can these crystals of guinea-pig's blood be regarded any longer as hæmoglobin seeing that all trace of colour or pigment has vanished from them? Is there such a thing as colourless hæmoglobin; are these things not contradictory terms? There is no question here of the removal of hæmatin or of iron from the crystals. The crystals have not been in contact with living tissues or with any active chemical substances at all. Hæmoglobin in old blood-clots, etc., in the living tissues is converted by the removal of iron into hæmatoidin, which, though not always crystalline, is always coloured. Reduced hæmoglobin we know, but it is still a coloured substance (purple), still a pigment; it has a spectrum. If these white, crystalline forms are not hæmoglobin, what are they? And if they are still hæmoglobin, the essence of which is to be a pigment with a spectrum, how can hæmoglobin be colourless? The bush that burned and was not consumed is simple compared with the problem here.

D. FRASER HARRIS.

Dalhousie University, Halifax, N.S.,
January 12.

Asteroids Feeding upon Living Sea-Anemones.

THE following instances of asteroids feeding upon living sea-anemones may be of general interest.

On October 27 three healthy examples of the sun-

©1916 Nature Publishing Group